Plastic Waste Management in Kenya

An Evaluation of policies and regulations on Plastic bags and Plastic bottles Waste in Nairobi

By

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DECLARATION

This project is my original work and has not been presented for a degree award in any other university.

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This project has been submitted for examination with our approval as university supervisors

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Abbreviations

AMREF: African Medical Research Foundation

DRS: Deposit Refund System

EIA: Environmental Impact Assessment

EMCA: Environmental Management and Coordination Act, 1999

EPR: Extended Producer Responsibility

HDPE: High Density Polyethylene

IISD: International Institute for Sustainable Development

KAM: Kenya Association of Manufacturers

KBS: Kenya Bureau of Standards

KIRDI: Kenya Industrial Research and Development Institute

KS: Kenyan Standard

LDPE: Low Density Polyethylene

NCC: Nairobi City Council

NEMA: National Environment Management Authority

NRB: Nairobi

OECD: Organization of Economic Co-operation and Development

PET: Polyethylene Terephthalate

SERC: Standards Enforcement and Review Committee

SMS: Short Message Services

ABSTRACT

Plastic waste issues have attracted widespread concern and attention in Kenya, particularly in the last five years, due to the widespread littering throughout the country. The rapid rate of urbanization throughout the world has led to the generation of increasing amounts of waste, including plastic waste and this in turn poses difficulties for disposal. The problem is more acute in developing countries such as Kenya. At present there is a large amount of plastic waste, particularly plastic bags and plastic bottles, which are seen littered all over in Kenya. This has led to environmental degradation, especially in major cities and towns in the country.

In this regard, a research study was carried out with particular reference to Nairobi as a case study and recommendations have been made that could contribute to the development of efficient policy approaches on plastic waste management and in particular as it regards the management of plastic bags and plastic bottles in Kenya. The study was limited to plastic waste management, with special emphasis on plastic bags and plastic bottles. Plastic bags and plastic bottles were chosen because they contribute extensively to littering, and pose a serious problem of disposal, especially in urban areas in Kenya.

During the study it was discovered that few policies exist to address the acute problem of waste management, leave alone plastic waste, in the country. The strengths, weakness and missing links of the existing policies were discussed with various stakeholders and recommendations made.

During the study, it became evident that waste management policies in Kenya have for a long time been unclear. This has been more so because of lack of clear guidelines on what constitutes waste and methodologies of collection, treatment and disposal of wastes. In the past, the Public Health Act and the Local Authorities by-laws have been used for addressing solid waste issues. The Public Health Act places a duty on all local authorities to provide solid waste management services. The Local Government Act gives power to local authorities to establish and maintain solid waste management services. The local

authorities such as the Nairobi City Council (NCC) have enacted several by-laws through which they attempt to regulate the solid waste management activities.

The only comprehensive legal and institutional framework for the management of the environment in Kenya is the Environmental Management and Coordination Act (EMCA) of 1999. The legislation was formulated to help in managing the environment including addressing associated issues such as waste management. The Act states "no person shall discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any person". However, detailed analysis of the Act has revealed that it has not been effective in dealing with the issues of plastic waste and its associated problems. The Act does not specifically address the issue related to plastic waste management. So the failure to incorporate a long-term solution to address the problem of plastic waste has been the key limitation of existing policies. As a result it has not been possible to address the issue of the littering of plastic bags and plastic bottles and as such there is no long-term solution to the problem.

Based on the study, a number of policy recommendations have been made that could assist decision-makers in their efforts to develop a comprehensive plan of action for plastic waste management in Kenya.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Governments and states endeavor to establish policies, legal and institutional education that would harmonize their development with approved environmental standards. This is in lieu of the fact that development unless properly planned can have disastrous effects on the environment (Ondiege1995)

Except for statutes in various Acts, there is no specific policy for solid waste management in Kenya. The Environmental Management and Coordination Act (EMCA) of 1999, defines waste as liquid, solid, gaseous or radioactive matter deposited into environment in a manner likely to alter the environment (Kariuki 2004). Increased environmental awareness in developed countries have led to the realization that a cleaner and better environment is essential for higher living standards to be maintained. This has led to the establishment of stringent environmental laws to govern uncontrolled and careless disposal of waste materials. Unfortunately, due to the lack of awareness, technical capability and financial ability many developing countries are unable to act, and as a result, indiscriminate dumping of waste is still prevalent (Sanchez and Juma 1964).

Today there is a staggering demand for plastic products in Kenya with the rising affluence and public embracement of western consumerism. However this expansion of plastic production and consumption is having a significant impact both visibly and invisibly on the environment and society in Kenya.

Evidence indicates that discarded plastic wastes-plastic bags and bottles make up a growing proportion of the solid wastes generated in Kenya today (own survey 2005). The rapid urbanization throughout the world has led to increasing amounts of waste being generated and this in turn poses great difficulties for the disposal. The problem is more acute in developing countries like Kenya where urbanization is quite rapid. Often post consumer waste is associated with packaging, which in turn finds an association with plastics. Plastics have become a major threat due to their non-biodegradability and high

visibility in the waste stream. Their presence in waste stream posses a serious challenge when there is lack of an efficient end of life management of plastics.

Plastic waste has attracted widespread attention in Kenya, particularly in the last few years, due to the widespread littering everywhere in the country. The environmental issues due to plastic waste arise predominantly due to the 'throwaway' culture that plastics propagate, and also the lack of an efficient waste management system. Problems have been identified in collection, transportation and disposal, and these arise due to the inefficiency of local authorities. Local authorities, which are responsible for collection, have failed in fulfilling their responsibilities in the face of increasing amounts of waste and the scarcity of financial resources for waste management.

Plastic waste management is also constrained by the lack of public awareness and lack of sufficient financial resources in local authorities in the country. Most local authorities do not have sufficient funds and this affects collection and disposal of waste in many urban areas in Kenya. Even where funds are adequate for collection, mismanagement of the resources as well as safe disposal remains a major problem. In essence, inefficient plastic waste management leads to a number of environmental problems. In view of the limited resources and availability of land for disposal, especially in the urban centres, there is a need for concerted efforts to develop cost-effective and feasible policy options for tackling the waste management problems, especially plastic waste.

In Nairobi where this study was undertaken, environmental problems due to plastic waste arise predominantly due to the throwaway culture that plastics propagate, and also the lack of an efficient waste management system, including lack of efficient policy approaches for plastic waste management in Kenya. For most Kenyan citizens the environmental problems of plastics have focused on the visible non-biodegradable plastic bags. Some of the main issues that have been associated with plastic bags in this respect are as follows:

- Plastic bags are non-biodegradable, which means that they do not dissolve or disintegrate into the soil. Besides, they are non-porous, and do not allow the free flow of water and air, thereby choking plants;
- Blocked drainage systems are a serious problem caused by the plastic bags. Since plastic bags are light, and in cities like Nairobi, where rains are sometimes heavy, plastic bags end up blocking drainage systems, thereby causing water logging and inconvenience to the citizens.
- Whenever cows graze close to the dumping sites in Kenya, they ingest the plastics along with organic waste in it. Plastic bags kill animals by obstructing their intestines.
- In addition to contributing to litter, plastic bags pose a major health hazard. The main hazards are associated with the chemicals used to colour plastic bags. Small amounts of lead are added during the manufacture, and these could permeate into food products stored in the bags. (own survey 2005)

Responsibility to protect the environment and enforcement of the existing regulation lies with the Ministry of Environment and Natural Resources in Kenya.

1.2 Statement of the problem

This study stems from the practical observation that plastic wastes are a menace in Kenya in general and in Nairobi in particular, hence the need for regulation and a policy framework to address the escalating problems associated with plastics. Plastics being non-biodegradable are an eye sore with their effects in Nairobi including but not limited to choked soils and drainage systems, threat to grazing animals and form breeding grounds for mosquito larvae when water collects on them.

The plastic sector has grown rapidly in Kenya and is considered the largest private investment with well over 150 industries with an estimated growth rate of seven percent (7%) per annum. (The East African Standard 10 November 2003; Kenya Association of Manufacturers 2005) With the growing environmental concerns caused by plastic generation, usage and subsequent disposal, a regulatory framework and a solid waste disposal policy on plastics need to be put in place as a check. This study examined the

weaknesses and strengths of the existing regulations and is intended to facilitate policy makers in developing a regulatory framework and policy on plastics.

This study focused on an evaluation of policies and regulations on plastic bags and plastic bottles - a case study of Nairobi and attempted to answer the following questions:

- What are the sources of plastic bags and plastic bottles?
- What are the environmental issues associated with plastic bags and plastic bottles?
- What are the existing policies on plastic waste aimed at addressing the above issues?
- What are the strengths and weaknesses of the existing policies?
- What policy options can be considered to address the existing problems?

The study surveyed plastic manufacturers, policy makers, waste handlers and recyclers and the consumers of plastic wastes in Nairobi.

Picture 1: Plastic bags and bottles in Dandora

1.3 Research objectives

The general objective of the study was to contribute to the development of efficient policy approaches for plastic waste management in Kenya. In order to do so, it was imperative to understand the issues relating to plastic waste.

1.3.1 Specific objectives

- To identify the sources of plastic bags and plastic bottles with emphasis on Nairobi as a case study;
- To determine the environmental issues associated with plastic bags and plastic bottles in Nairobi as a case study;
- To highlight the existing policies on plastic waste aimed at addressing the above issues;
- To determine the strengths and weaknesses of the existing policies;
- To recommend policy options that could contribute to the development of efficient policy approaches for plastic waste management in Kenya.

1.4 Justification of the study

Increasing amounts of plastic waste are being generated following the rapid rate of urbanization in Kenya. Today, there is a staggering demand for plastic products. However, this expansion of plastic production and consumption is having a significant impact on the environment in Kenya. Discarded plastic products and packaging make up a growing proportion of the solid waste generated in Kenya today. The most commonly used plastic materials are not biodegradable and this has been a cause of concern. Plastic has become an accepted part of our lives, very useful in many ways but extremely harmful to the environment once discarded.

Undertaking this study was important because it could contribute to the development of efficient policy approaches for plastic waste management in Kenya. The research findings are expected to assist decision-makers in the efforts to develop a comprehensive plan of action for plastic waste management in Kenya.

Picture 2: Scavengers sorting out plastic waste at Dandora

1.5 Scope and limitations of the study

The study was limited to an evaluation of policies and regulations on plastic bags and plastic bottles - a case study of Nairobi. Plastic bags and plastic bottles were chosen because they contribute extensively to littering, and pose a serious problem of disposal, especially in urban areas in Kenya. The study focused on the city of Nairobi since it is a good example of urban centres in the country faced with increasing population, increasing urban waste and poor local authority services. The research has attempted to make an assessment of the existing policies relevant to the study.

In terms of limitations, the study does not elaborate on the mechanisms of implementation of the policy recommendations. Further, while the study was limited to Nairobi, the recommendations will have countrywide implications.

1.6 Conceptual Framework

Pfammatter and Scherteinlaib (1996) provide a cause and effects of inadequate waste management and collection service delivery in low-income urban areas. This has been adapted and modified. The model focuses on waste minimization as a strategy to solving solid waste and plastic waste menace.

Evidence indicates that discarded plastic products, particularly plastic bags and plastic bottles make up a growing proportion of the solid waste generated in Kenya today. With the advent of what we might call the 'plastic age' and an exponential increase in the use of a wide variety of plastic materials, their safe disposal has presented a growing and, it seems, insurmountable problem.

The model takes into account that solid waste collection depends on local governments and private sector's adequacy in service delivery. Proper service delivery leads to least polluted residential areas while inadequate service delivery leads to accumulation of waste or pollution of the residential areas. The resultant outcome is either poor health, unpleasant environments with reduced aesthetic value if services are poor or healthy, pleasant environments with improved aesthetic values if the sector's services are up to standard. The above solid wastes will be minimized through, reduce, reuse, recycle, recovery and disposal strategies.

The environmental issues due to plastic waste arise predominantly due to the 'throwaway' culture that plastics propagate, and also the lack of an efficient plastic waste management system. Problems have been identified in the collection, transportation and disposal, and these primarily arise due to the inefficiency of local authorities. Local authorities, which are responsible for collection, have failed in fulfilling their responsibilities in the face of increasing amounts of waste as a result of the increase in urban populations. The model sees private sector participation as a possible opportunity

in municipal solid waste management and not a panacea. Private sector involvement comes in where the existing service delivery is either too costly for local authority or is inadequate.

Presend (1997) has argued that most urban waste pollution is mainly attitudinal problem. She asserts that littering cannot be solved by regulations alone because they are not likely to be obeyed. Motivation and attitudes must be considered in designing policies. As a result of this, the residents' attitude is at the center of the model as an integral part of solving the plastic waste problem. It becomes quite necessary when we talk of separation at source, reuse, recycle and recovery since it's the people who generate wastes and pollute and its them again that can help reduce the same. Source reduction is often adopted as a key element of a waste management strategy aiming for resource efficiency, and ultimately, sustainable development. Waste prevention stands apart from the other options in the waste hierarchy because it principally addresses the causes rather than the outcomes of waste generation. Clearly, the less waste that is produced the less waste there is to dispose of. Moreover, reducing waste either from the production process or in the shape of post-consumer waste helps to conserve scarce resources, and reduces the potential environmental problems associated with waste disposal. Waste prevention is therefore the single most important initiative towards achieving sustainable waste management.

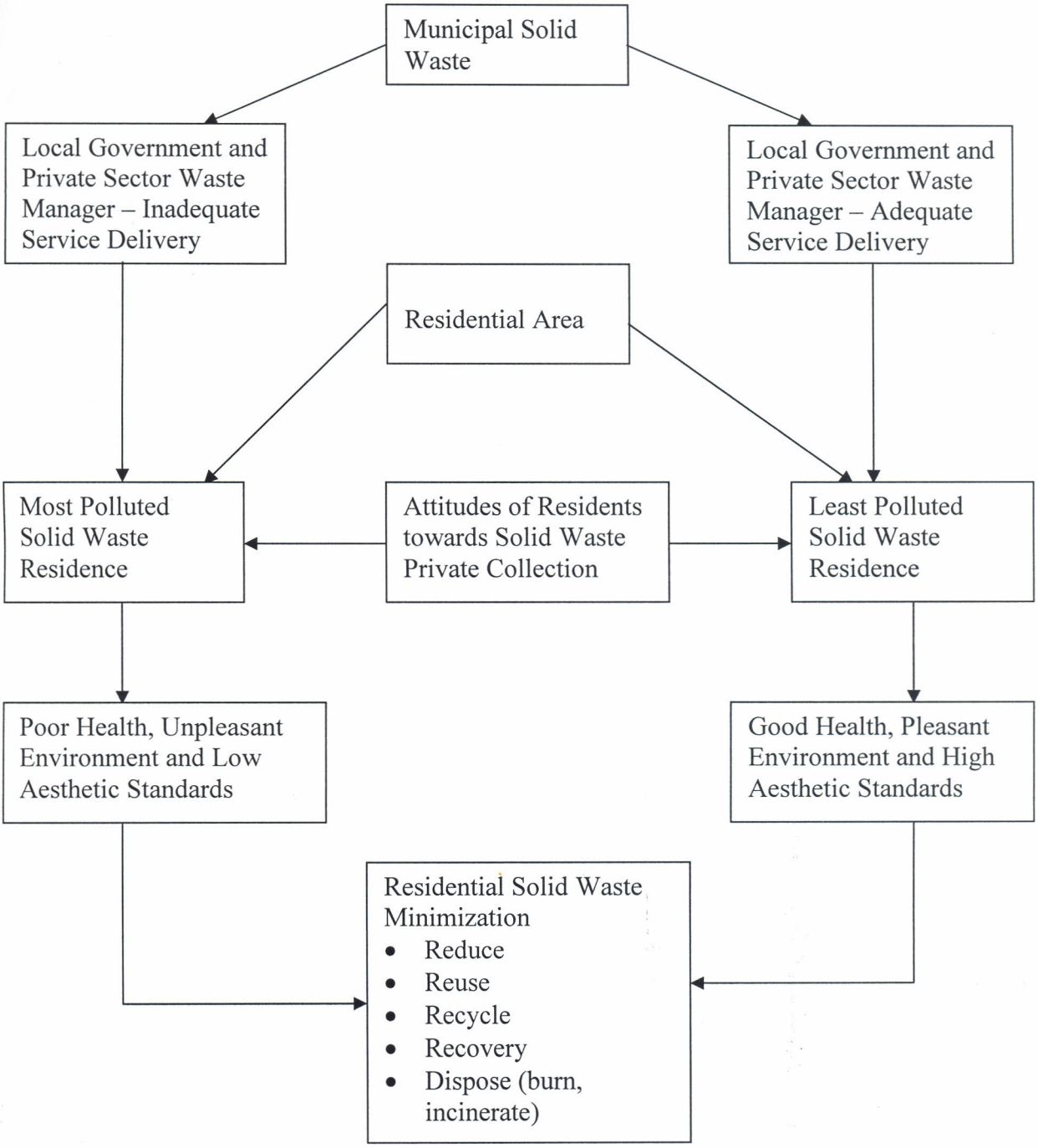


Figure 1: Plastic Waste Minimization in Nairobi Residential Areas

Source: Adopted and modified from Pfammater and Schertainlaib (1996)

CHAPTER TWO

2.0 LITERATURE REVIEW

Except for statutes in various Acts, there is no specific policy for solid waste management in Kenya. The Environmental Management and Coordination Act, defines waste as liquid, solid, gaseous or radioactive matter, which is discharged, emitted or deposited in the environment in such volume, composition or manner likely to cause an alteration of the environment (EMCA, 1999 page 62). Increased environmental awareness in developed countries have led to the realization that a cleaner and better environment is essential for higher living standards to be maintained. This has led to the establishment of stringent environmental laws to govern uncontrolled and careless disposal of waste materials. Unfortunately, due to the lack of awareness, technical capability and financial ability many developing countries are unable to act, and as a result, indiscriminate dumping of waste is still prevalent (Sanchez and Juma 1964). A policy is a plan of action to guide decisions and actions. Regulatory policies limit discretion of individual business owners and corporations. Businesses who disregard these policies may be fined, or may be threatened with sanctions. A framework can be considered as the processes and technologies used to solve an issue. It is the skeleton upon which various objects, including policies and by-laws, are integrated for a given solution.

The rapid rate of urbanization throughout the world has contributed to the increasing amounts of waste, including plastic waste and this in turn poses difficulties for disposal. The problem is more acute in developing countries such as Kenya. The rapid expansion of urban, agricultural and industrial activities spurred by rapid population growth has led to the generation of vast amounts of solid and liquid waste that pollute the environment. The management of solid waste is often weak due to lack of appropriate planning, inadequate governance, poor technology, weak enforcement of existing legislation, if any, and the absence of incentives to promote environmentally sound development.

Plastics are man-made organic materials that are produced from oil and natural gas materials. Plastics may be regarded as long chains of beads in which the so-called monomers such as ethylene, propylene and vinyl chloride are linked together to form a chain called a polymer. Polymers such as polyethylene, polypropylene, polystyrene and polyvinyl chloride are the end products of the process of polymerization, in which the monomers are joined together. In many cases only one type of monomer is used to make the material, sometimes two or more. Melting the basic plastic material in the form of pellets or powder can make a wide range of products.

Packaging has been identified as one of the major activities that contribute to the high utilization of plastics in the country. Most of the plastics are non-biodegradable, making them a major threat to the environment. Considering that there is lack of efficient policies for the management of plastic waste in the country, their presence in the waste stream poses a serious problem to the environment.

According to Reed (1996) many reforms associated with structural adjustments have potentials to improve both environmental and economic outcomes. He adds that failure to implement complementary environmental policies and or strengthen institutions and regulations has created a very mixed environmental record.

Evidence indicates that discarded plastic products, particularly plastic bags and plastic bottles make up a growing proportion of the solid waste generated in Kenya today. With the advent of what we might call the 'plastic age' and an exponential increase in the use of a wide variety of plastic materials, their safe disposal has presented a growing and, it seems, insurmountable problem.

Nyang'ech (1992) considers community participation as forming an important element in implementing projects. Attitudes, beliefs and culture of people play a significant role in coming up with solutions for solid waste management.

Apart from the formal system that includes the local authorities, there are private waste collectors and recyclers who try to solve the problem of solid waste. However, plastic bags and plastic bottles do not figure in their priorities, because collecting and recycling them is not profitable since there is no ready market for recycled products. With the formal and informal sector failing to collect such waste, Kenya's landscape is littered with plastic bags and plastic bottles, with plastic bags dominating the litter. Plastic bags have in particular been of great concern since they have contributed to a host of environmental problems in Kenya such as choked sewerage systems, hence leading to breeding grounds for mosquitoes.

World Bank (1994) emphasizes that policies must stress the development of appropriate standards and effective monitoring and enforcement systems. These should include traditional command and control as well as market based economic instruments. Few policies have been implemented to address the acute problem of plastic waste in Kenya.

Generally the Acts are deficient in setting standards and conditions covering the key aspects of solid waste management particularly operational aspects. The Acts do not define standards for collecting, treating and transporting solid wastes or for the proper management of landfills and they do not refer to waste reduction or recycling. Enforcement mechanism and penalties are contained in the existing by-laws. However, enforcement seems to be weak since the by-laws fail to define the standards of waste, penalties are low and do not deter violators.

The only comprehensive legal and institutional framework for the management of the environment in Kenya is the Environmental Management and Coordination Act (EMCA) of 1999. The legislation was formulated to help in managing the environment including addressing associated issues such as waste management. The Act states "no person shall discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any person". However, detailed analysis of the Act has revealed that it has not been effective in dealing with the

issues of plastic waste and its associated problems. The Act does not specifically address the issue related to plastic waste management. So the failure to incorporate a long-term solution to address the problem of plastic waste has been the key limitation of existing policies.

The problems related to plastic bags and bottles have predominantly arisen due to indiscriminate use and disposal, and the lack of an efficient waste management system. The Act fails to address this indiscriminate use by creating suitable disincentive towards use of plastic bags and bottles. Further, the Act fails to make provisions for improving the existing waste management system in Kenya.

Effective environmental management policies must also be rooted in an appropriate institutional structure embodying political, administrative and technical instruments arrangements (Habitat 1986). Without enabling legislations, rules and regulation, adequate administration, policies will not be implemented.

Since there is no specific policy that deals with plastic bags and plastic bottles in Kenya, various issues associated with plastic waste and recycling have been discussed. In the case of Nairobi, the rising consumption of plastic bags and plastic bottles is associated with the changing consumptions patterns.

In view of the above, a few recommendations have been made that may assist in formulating future policies for plastic waste management. Plastic bags and bottles clearly present a problem of downstream consumption. So it would be useful to consider measures such as environmental tax that could contribute towards minimizing consumption while at the same time generating revenue that could be utilized for improving the plastic waste management system as well as for research and development activities.

Reorganization of the recycling sector would help to effectively utilize the waste available through source separation and thereby improve the quality of recycled products

to an extent that they can impinge on the virgin market. Incineration coupled with energy recovery, could be another measure to minimize the immediate waste disposal problems in Kenya; but this could also aggravate pollution problems if strict standards are not enforced. In addition, there are huge costs associated with incineration, if it has to be profitable and carried out in an environmentally friendly manner.

However, realizing all the beneficial policy objectives necessitates an active participation and cooperation of all the stakeholders at various levels.

2.1 Profile of the Plastic Sector in Kenya

The plastic sector in Kenya has grown rapidly in the recent years. The sector is considered the largest private investment with well over 150 industries and with an estimated annual growth rate of seven per cent (The East African Standard 10 November 2003). The production capacities range from 1000 to 8000 tonnes per year.

According to the Kenya Association of Manufacturers (KAM 2005), the sector employs approximately 100,000 people both directly and indirectly. Most of these industries are located in Nairobi and Mombasa, with a few others located in Kisumu, Nakuru, Eldoret and Thika. The plastic industries sector has benefited from the new technological changes that have occurred in the manufacturing industries sector combined with a shift in demand for plastic products. The overall result has been increased production and huge demand for plastic products.

An estimated 4,000 tonnes of the thin plastic bags are produced each month in Kenya mainly for shopping purposes (Kimilu D. – KAM 2005) About half of them are less than 15 microns thick and some are as little as seven microns thick. According to one of the leading supermarket chains in Kenya, approximately 8 million plastic bags are given out by the supermarket alone every month and two times as much in the informal sector in Kenya.

"With the exception of some paper bags, there are hardly any alternatives to plastic shopping bags. Alternatives such as boxes and paper bags cannot handle liquids as well as plastic bags do. Simply put, plastic bags are popular with consumers because they are functional, lightweight, strong, cheap and hygienic (KAM 2005). Packaging presents a major growth area where there has been a spiraling demand for plastics.

2.1.1 Plastic shopping bag industry in Kenya

There are two major types of plastics produced in Kenya namely, hard plastics and flexibles. The flexibles, into which category plastic shopping bags fall, can be categorized into:

High-density polyethylene or HDPE bags: These are usually non-branded and used in supermarkets, take-away food and fresh produce outlets, and small retail outlets. Bread bags also fall under this category.

Low-density polyethylene or LDPE bags: These are 'boutique' style type of bags, generally branded (designer) and are used by stores selling higher value goods, such as department stores, clothing and shoe outlets.

Others: Dry cleaning bags, garbage bags, plastic in-store product bags, and other packaging.

According to industry estimates, about 4000 tonnes of flexibles are produced monthly in the country, with an estimated 2000 tonnes going into the waste stream. About half of the flexibles produced in the country are less than 15 microns in thickness. For instance, the plastic bread bags are between 6 and 7 microns. It is these thin plastic bags that are most prone to inadvertent littering. Most shopping bags (about 90 per cent) are produced from virgin material, with the rest produced from recycled material. Although almost all of these flexibles are produced within the country, all the raw materials are imported from Saudi Arabia, Japan and Europe. However, the inks for printing the designer bags are locally produced, although the base is imported and reformulated locally.

The Kenyan flexibles industry is lucrative and is growing at an estimated rate of 8-10 per cent per year. This growth is driven not only by local demand but also demand from the regional market - demand from Uganda in particular, is very strong as plastics produced there attract an excise duty. Ownership of the plastic firms is predominantly Kenyans of Asian origin. Besides offering considerable employment, the industry also supports many street families who are engaged in the distribution of the plastic bags.

The level of recycling and reuse of post-consumption flexibles is very low. Recycling has not been widely practiced as a result of various factors including: lack of technology, high costs (especially on energy and water) and available space. In addition, the market for recycled products is not well developed. However, some firms are already recycling flexibles. Products like water tanks, for which there is a great demand, are made almost entirely from plastic wastes. (Own survey, 2005)

With the exception of some paper bags, there are not many alternatives to plastic shopping bags in the country. Shopping bags made from natural products are available but are hardly used because of the easy and free availability of plastic shopping bags in market outlets, and the low price at which the plastic bags are sold in outdoor markets.(Own survey, 2005)

Environmental policies typically combine the identification of an objective with some means to achieve that objective. The objective of a policy in addressing an issue is very important, since targeting the right objective is crucial in alleviating the problem. To evaluate the policy as to its effects on sustainable development and resource use, it is necessary to review the objectives of the policy (IISD, 1995).

2.2 Objectives of Sustainable Waste Policies

Sustainable waste policy starts from the base line objective that the generation of waste should be optimally prevented. The following reflects the main principles for sustainable waste management (OECD, 1993):

1. Prevention of waste generation at source as the first priority
2. Waste minimization
3. Reuse and recycling should be practiced to the extent possible
4. Treatment of waste prior to disposal
5. Disposal is the least preferred option.

2.3 Characteristics of Sustainable Environmental Policies

There are various types of environmental policies and each type anticipates that stakeholders will respond to it in a particular way. Each of them has some specific characteristics that make it more likely to succeed in certain circumstances, and not in others. In evaluating the effectiveness and appropriateness of the policy for addressing a given environmental problem, it is important to have in mind a clear set of policy evaluation criteria (Field, 1999).

Most environmental polices broadly cover the three Es: environmental effectiveness, economic efficiency and equity (O'Connor, 1996). Apart from the three Es there are also issues pertaining to political acceptability, administrative feasibility, industry response, monitoring, and enforcement, legal and institutional requirements. A brief discussion on some of the essential criteria is as follows:

2.3.1 Equity

Equity involves an assessment of the extent to which provisions are made for the involvement of all the stakeholders in bringing a change (IIISD, 1995). Ideally regulation should be fair to ensure that all the stakeholders contribute towards a change. Policies are better if they do not place an unfair burden on any member of the society.

2.3.2 Environmental effectiveness

A policy is said to be effective when it is able to achieve the environmental goal that is desired. Environmental effectiveness is indicative of the extent to which the policy succeeds in reducing environmental impacts in general, in relation to the policy targets

set, (OECD 1999). Hence environmental effectiveness is an essential criterion in evaluating environmental policies.

2.3.3 Administrative feasibility

The administrative feasibility of policy implementation depends to a large extent on the design of the policy, and the effectiveness of the administrative authority charged with enforcing environmental protection measures. There is no sense in creating a policy that is essentially impossible to enforce, (Field 1999). Therefore policies should have both low administrative complexity and compliance costs.

2.3.4 Cost efficiency

A policy is cost efficient if it can produce the maximum environmental benefit for the resources being expended, or it achieves a given amount of environmental improvement at the least possible cost (Field, 1999). Costs are important, especially in less developed economies, where people have fewer resources to invest in environmental programmes and cannot afford policies that are not cost efficient (Field, 1999).

2.3.5 Incentives for improvements

Another important criterion that should be used to evaluate an environmental policy is whether the policy provides a strong incentive for individuals and groups to find new innovative ways of reducing their impact on the environment (Field, 1999).

2.3.6 Social and political acceptability

Political acceptability refers to the extent to which the policy fits in with the government's wider priorities – which are, of course, greatly influenced by pressures emanating from a wide range of interest and pressure groups, as well as the mass media and the general public. It is very important to know the extent to which concerned groups in society are ready to accept the new policy (OECD, 1993). Consequently it is important that there is a consensus among different stakeholders on the policy so that it can be effective.

The above facts present the key criteria that policies need to abide by, in order to be sustainable.

CHAPTER THREE

3.0 LOCATION OF THE STUDY AREA

3.1 Introduction

This study was carried in Nairobi to assess the weaknesses and strengths of existing policies and legislations on solid waste management with a specific focus on the management of plastics. It also focused on plastic manufacturers, policy makers, consumers of plastic bags and bottles as well as refuse handlers and recyclers in Nairobi.

3.2 Location and size

The City of Nairobi is situated in the southern end of the agricultural heartland of Kenya, 1.19° south of the equator and 36.59° east of the prime meridian. The administrative boundary covers an area of 690 sq. Km. (268 sq. miles) and is on latitude of 1670 metres above the sea level. It is by far the smallest administrative province in Kenya but yet the most important in terms of the activities and functions it performs. Apart from being the capital city of Kenya, it is the largest urban centre not only in Kenya but also in East Africa (Obudho, 1987, 1995 and 1992:50-62 and Obudho and Muganzi 1991:108-120).

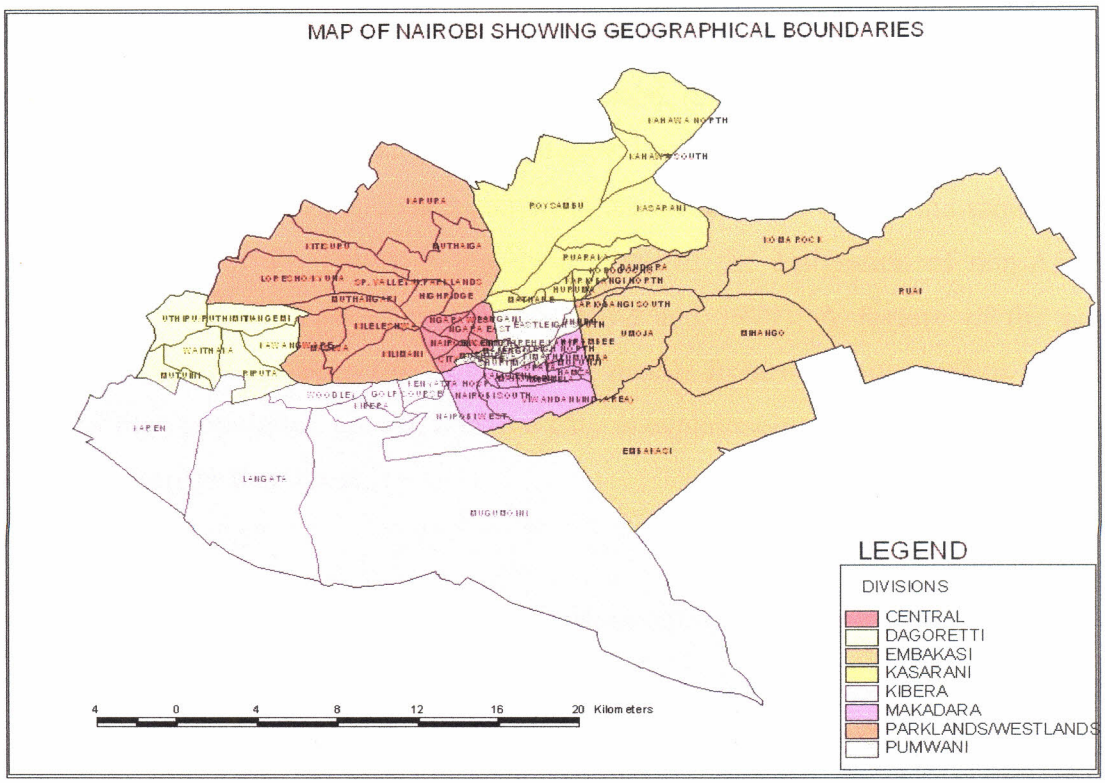


Figure 2: Map of Nairobi showing geographical boundaries

3.3 Population Growth and Demographic Dynamics

The population of the City of Nairobi was estimated at 5 million people in January, 2000 and is growing at an annual rate of 5.7 percent mainly due to rural-urban migration, urban natural increase and international migration, among other non spatial factors. It is estimated that by the end of the century the population of the City of Nairobi will be over 10 million people. It is projected that about 500,000 potential wage earners will be unemployed and that 1,000,000 families will need to be sheltered by the year 2025. This increase has and will continue to exert a lot of demands on the environment unless proper and adequate measures are taken to contain the situation. Already almost 80 percent of the City of Nairobi's residential land has less than 20 percent of the population, which is mainly the higher income group in sub-urban planned residential developments. 80

percent of the Nairobi's population sprawls on the remaining 20 percent of the residential land with attendant social and environmental problems.

The population grew from 11,512 people in 1906 to 118,976 people in 1948. By 1962, the Nairobi had an urban population of 266,795 people. Between the 1948-1962 censuses, the population grew at an average rate of 5.9 percent per annum. Rapid urbanization is, therefore, a post-independence period, (Obudho and Maganzi, 1991:108-1991). The African and the Asian population grew hand in hand with the total population until 1960 when the Asian population started to decline at more or less the same rate as the European population. This was mainly because of the emigration of non-African population following independence (Tiwari, 1972 and 1979). A feature of the post-independence period has been the movement of people from the rural areas to Nairobi. Because of high population growth rate, the City is experiencing high density settlement pattern especially in East lands.

3.4 Solid Waste Generation, Collection, Transportation and Disposal in Nairobi

The rapid rate of urbanization throughout the world has contributed to the increasing amounts of waste, including plastic waste and this in turn poses difficulties for disposal. The problem is more acute in developing countries such as Kenya. The rapid expansion of urban, agricultural and industrial activities spurred by rapid population growth has generated vast amounts of solid and liquid waste that pollute the environment. The management of solid waste is often weak due to lack of appropriate planning, inadequate governance, poor technology, weak enforcement of existing legislation, if any, and the absence of incentives to promote environmentally sound development.

About 1,000 metric tonnes of mixed municipal refuse is generated in -the city of Nairobi *each day, with about 57% being from residential areas and 43% from commercial areas,* (NCC, 1999). Each industry is assumed to be responsible for disposal of its wastes. The municipal waste consists mostly of organic matter averaging about 60-80% readily biodegradable organics and 20% paper Storage of Solid Wastes content (NCC, 1999).

Storage of refuse in residential areas is supposed to be accomplished by means of standard dustbins provided by the NCC at a subsidized rate. They are also expected to provide bulk containers to squatter areas, institutions, commercial and market places. Unfortunately due to financial constraints, not all houses have been provided with these facilities, thereby resorting to the use of cartons and drums whose contents they either dump anywhere or burn.

A major problem facing the city of Nairobi residents is luck of dustbins to cater for their needs and non-collection of refuse on a regular basis. Essentially the removal of solid wastes from various storage containers in both the residential and commercial areas to the disposal site or transfer stations is accomplished by various means, depending on the accessibility and storage containers in use. These include light vehicles, ordinary trucks, side loaders, compactor trucks and bulk container vehicles. Clearly, the type of vehicles used for solid waste collection in the city of Nairobi is unsuitable for the task. Broadly speaking, the vehicles are either open trucks - usually meant for carrying construction materials, or highly mechanized refuse trucks acquired from the industrialized countries. The open trucks are not optimum in operation, for example, their loading height is not suitable for operators, they also do not compact the refuse, obviously not carrying an optimum load at each run, they also tend to spill refuse along the route because the refuse would normally be loose.

Disposal in the city of Nairobi consists of open dumping, burning, composting and crude sanitary landfilling. In low-income estates where the collection service is very poor, the commonest mode of disposal of refuse is by dumping it along the streets, play-fields and between houses. This is done mainly by householders carrying filled up bins at night and emptying their contents. The main solid waste disposal method in the city of Nairobi is by crude sanitary landfilling. This technique approximates to dumping and since the costs involved are nominal, it is the most popular and favoured technique. There is reported to have been one proper landfill in the city of Nairobi in the mid-1970s at the National Youth Service and this has since filled up and been reclaimed. Presently, Dandora refuse off the main road to Dandora estate towards Nairobi River and about 100 metres from the

river is the main site. All other sites for example, Kibera tip was abandoned in 1989 and this means vehicles from as far as Karen, Kawangware and even Kenyatta University have to come all the way, there making transportation costs prohibitive. The practice of vehicles criss- crossing the city should be discouraged and suitable sites found at all ends of the city and also transfer stations established to minimize transportation costs and improve the efficiency of solid waste collection. This also receives wastes from hospitals and factories.

In terms of equipment, Dandora is inadequately served, to say the least. The bulldozer, which helps in disposal, is of age leading to constant breakdowns. The fact that they have not bought others for the job tells one how much priority they attach to actual disposal. Furthermore, the Dandora site has no fence and vandalism is quite rampant. In fact when a truckload arrives at the site, it is almost impossible for work to continue straight away as the number of scavengers is quite high and it becomes hazardous for the bulldozer to continue with its operations. These scavengers do not look for just anything but mainly glass bottles, tin cans plastic containers and paper. The NCC has attempted to stop scavenging at this site without success.

3.5 Historical Development of Industrialization in Nairobi

A historical analysis is of importance in comprehending the industrialization processes that have taken place in Nairobi. The analysis highlights the inherited colonial legacy and its impact on industrialization. The resulting governmental policy is then reviewed at the end, so as to situate the structural and spatial characteristics of industrial development in Nairobi. The industrial evolution of manufacturing industries in Nairobi that has taken place within the last hundred years has also been highlighted.

3.5.1 Spatial Distribution of Industries in Nairobi

The spatial distribution of industries in Nairobi has grown beyond the original officially demarcated industrial zone, which in 1947 comprised 2,800 acres, or 12 per cent of the total city area (Hallman and Morgan, 1967, p. 116). Prior to this, a significant number of industries were located in the central business district (CBD) (Morgan, 1976). Today the

main industrial area, which is found to the southeast of the city's CBD, also includes new industrial zones such as Dandora, Ruaraka, Kasarani and Kahawa. The siting of these industrial zones has attempted to take advantage of available infrastructure and the available land. However, the environmental concern appears not to have been a determinant factor in the siting of these zones. This is clearly manifested by the inadequate industrial waste disposal systems and the industrial pollution of the Nairobi River and the environs.

This pattern of concentration reflects the agglomerating force of the industrial environment in Nairobi that has tended to draw industry closer together. For instance, savings due to proximity to auxiliary industries, better marketing outlets or economies of scale localize industry. By locating in Nairobi the manufacturing industries are able to share many kinds of costs that they would have to provide internally if they were located in a less urbanized area.

Non-economic factors such as familiarity with the location, personal contacts, and local knowledge also assist in further explaining the over-concentration of these industries in Nairobi and the major urban centres. This is because many of the entrepreneurs do not usually have a perfect knowledge of neither all the available possibilities of investment nor the guarantee of profits in other areas. Moreover, if a firm has to investigate the alternative locations at its disposal for a new industrial establishment that firm incurs extra expenses. This means that most firms do not normally carry out investigations of alternative locations, instead they locate where there already is an industrial concentration. This is based on the assumption that it is the best location since most of the industries are already located there. Another factor that has influenced the location of manufacturing industries in Nairobi is demand for the consumer goods produced by industries. The role of the Government has also indirectly influenced the location of these industries through the provision of industrial infrastructure and various institutional inducements.

3.5.2 The Industrial evolution of manufacturing Industries in Nairobi

In order to elucidate the salient features more clearly, the historical development of industries is analyzed two periods: 1899 – 1963 and 1963 – to the present.

Colonial Era (1899-1963)

Industrial activity in Nairobi initially began by processing the raw materials produced on the settler farms on a local scale. But by 1939 factory production was already taking place. The locational characteristics of industries at that time were purely raw material orientated.

Inter-war period (1918 - 1939)

Industrialization during this period did not receive much support or encouragement from the British government. This is because it saw the colonies purely as suppliers of raw materials for the British industries. At the same time the colonies were considered as markets for British industrial goods. It was, therefore, not in the interest of the British government to promote industrialization in the colonies. This was reinforced through lack of financial assistance and policy instruments designed to protect British manufacturing industries. With the enactment of the Colonial Development and Welfare Act in 1940 British funds for industrial investment were suddenly forthcoming.

The outbreak of the Second World War drastically changed the Colonial Office's attitude towards industrialization in the colonies. This is because at this time it became increasingly more difficult for Britain to export its manufactured goods to the colonies. This led to an acute shortage of consumer and capital goods in the colonies. The only foreseeable solution was thus the development of manufacturing industries in the colonies. This policy continued to be pursued even after the war (Opondo, 1997; Boedecker, 1936; Obudho, 1988d). During this period there were a number of industries that were established - some of which are still operating today.

Post-war period (1945 - 1963)

The post-war period saw the growth of industrial investment accelerate at a relatively faster pace. Among one of the factors determining this rate of investment was the growth

of the multinational corporations. Secondly, strong encouragement and support for industrialization in the colonies (which had been virtually non-existent prior to the war) was forthcoming from the Colonial Office. The colonial administration in Kenya was instructed not only to provide industrial infrastructure (for example, roads and water supplies), but also to offer special inducements (for example, subsidies and tax concessions) to potential investors. Thirdly, the positive investment climate and protective tariff walls in the colonies encouraged British firms to invest there.

Apart from that, a significant amount of aid administered to East Africa was channelled into training a skilled labour force for the industrial and agricultural sectors. By 1959 tariff barriers had been implemented as part of a system for protecting the industries in the colonies. Various government bodies were also created in Kenya during this period to promote industrial development. For example, the *Colonial Development Corporation* (CDC) was the main instrument of British policy in reinforcing industrial development in the colonies. In some instances it actually went as far as subsidising certain production processes until these became profitable. (Obudho, 1988c; Morgan, 1976; Boedecker, 1936).

By the mid-1950s, foreign firms were manufacturing a wide range of products. The industrial structure that emerged was one that was highly concentrated. In other words, one or several firms dominated each branch of production. After 1945, Asian capital began to extend into the manufacturing sector. This had the impact of radically altering the ownership patterns in industrial production. The problem of access to credit facilities was resolved by the setting up of the Asian banks in 1945.

The post-independence era (1963 - to date)

At the time of independence most of the manufacturing industries were those inherited from the colonial era, thereby exhibiting similar structural characteristics with their predecessors. However, changes in macro-economic policies and ownership continue to alter certain structural features of these industries.

Structural Characteristics

A look at the overall post-independence performance of the industrial sector shows that, Kenya enjoyed initial bursts in the growth of the manufacturing sector up to the 1980s (Figure 2). Between 1972 and 1979 the trend indicates rising growth rates, which reached its peak in 1977. This could be due to increased incomes (because of the coffee boom) which then translated into increased demand for manufactured goods. The decrease in manufacturing growth between 1974 and 1975 came as a result of the international oil crisis experienced during this period. Generally, the manufacturing sector in Kenya expanded by annual average rates of 10.5 and 3.8 per cent during 1965-1980 and 1980-1985 periods respectively. These high growth rates have mainly been attributed to the narrowness of domestic demand, import substitution and export growth.

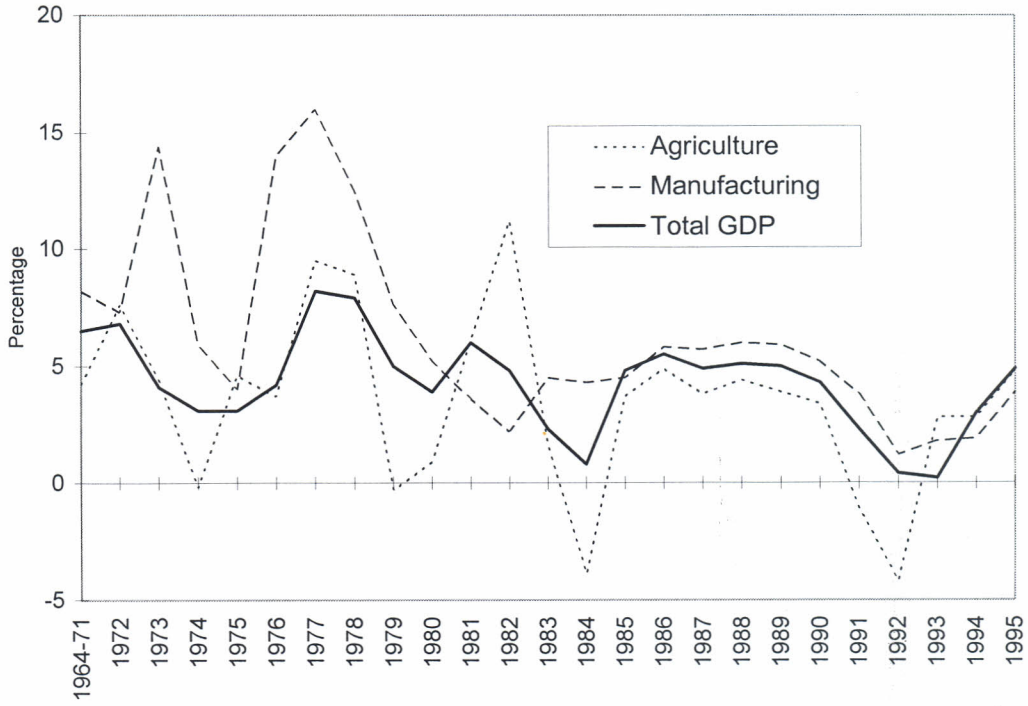


Figure 3: Growth rates of real GDP, manufacturing and agriculture, 1964-95

Source: Opondo, 1997, p. 55

3.6 Natural resources

The City of Nairobi is located in a high resource potential area. Most of the energy and food requirements are obtainable within a short distance from the city. Within its farmland, agriculture takes place. This involves the growing of vegetables, fruits, herbs, flowers and fuel wood, among others. The rest of the food consumed in the City of Nairobi originates from the farmland, which are agriculturally productive areas. The immediate environment of the City of Nairobi consists of the productive highland area extending northwards and westwards to embrace the rich farming lands of Rift Valley. Within the radius of about 10 km from the Central Business District (CBD), there is diversification of agriculture. Beyond this zone and in the suburbs, commercial ranching is carried out for the production of milk, meat and pork, to be consumed by the Nairobi residents.

CHAPTER FOUR

4.0 RESEARCH METHODOLOGY

4.0 Introduction

This chapter describes the methodology used in this study, the sample population and sample size used, the sampling techniques and the data collection methods and subsequent data analysis.

4.1 Sample population and Sample Size

In order to obtain insightful data and information to satisfy research objectives and adequately obtain information from all the stakeholders involved, it became necessary that the population under study be classified as; plastic manufacturers, policy makers and environmental protection agencies/organization, plastic consumers and waste recyclers and handlers.

In the category of plastic manufacturers, a sample frame of 100 industries was obtained. Note that the plastic sector has grown rapidly in Kenya and is considered the largest private investment with well over 150 industries with an estimated growth rate of seven percent (7%) per annum. (The East African Standard 10 November 2003; Kenya Association of Manufacturers 2005) The 100 industries contained in the sample frame were considered to be the major producers of plastic in the industry hence very significant in the study. For the purposes of interviews and questionnaire distribution a sample size of 25 that represents one quarter of the sample population was drawn by simple lottery to come up with the sample size from the sampling frame.

For the case of the interviews with policy makers and environmental protection agencies /organizations, a sampling frame comprising of 60 institutions was developed for the study. From this frame 15 institutions were selected using both purposive sampling and thereafter-simple random sampling for purposes of in-depth interviews and questionnaires distribution. Certain institutions had to be interviewed such as NEMA,

Nairobi City Council and therefore the researcher had to purposefully select such before subjecting the rest of the samples to simple random sampling.

The sample frame for plastic consumers mostly comprised supermarkets, retail shops and other businesses where packaging for customers involved the use of plastics like groceries and butcheries among others. The sampling frame for this class of plastic waste producers was 60 from where a sample size of 15 was drawn for the actual interviews and questionnaires issue. These were randomly drawn by simple lottery to come up with the fifteen for interview.

The last class comprised of waste handler sand recyclers such as companies that are involved in waste collection and disposal, waste recyclers and scavengers (chokoras).

A sample of 12 companies and youth organizations that deal with domestic and industrial waste collection were interviewed. This was drawn randomly from a sample of 48 groups identified by the researcher as being either handlers or recyclers of waste. The group comprising the scavengers especially at the Dandora dumpsite was so large but a sufficient sample of 20 scavengers at the site were interviewed

4.2 Sampling techniques

The study employed three sampling techniques that ran throughout the research period. These were either used individually or concurrently where one technique had to used followed by the other. These were:

4.2.1 Purposive sampling

The researcher had to purposefully use his own judgments to determine which samples to be interviewed.

Since the subject was very specific (plastics), non-probability sampling was most useful at the start and as the study progressed since the researcher had to use his judgment to determine the plastic manufacturers, refuse handlers and recyclers among others. The identified respondents in each category of population formed the sampling frame from which samples were later drawn randomly for interviews. This ensured that he narrowed down to the most relevant sources of information to avoid the less viable sources hence purposive sampling.

4.2.2 Snowball Sampling

The task of identifying the relevant respondents, policy makers, manufacturers, refuse handlers and recyclers was an involving task since little research have been done on plastic waste. It became necessary that the already interviewed respondents suggest to the researcher any other possible source or respondent who would be information rich for the next interview. This proved quite useful in identifying the various plastic manufacturers who operate on large scale. This resulted into a snowballing scenario thus the snowball sampling as used by the researcher. Snowball sampling is a technique for developing a research sample where existing study subjects recruit future subjects from among their acquaintances. Thus the sample group appears to grow like a rolling snowball.

4.2.3 Simple Random Sampling

Sampling frames were developed for all plastic manufacturers; policy makers and environmental protection agencies /organization, plastic consumers and the possible refuse handlers and recyclers. From these sample frames, a simple lottery was conducted by crumbling pieces of papers with the details of the possible respondents were rolled and put into a jar from where samples were drawn randomly after a thorough shake-up of the jar without replacement .A total of 25 samples were drawn for plastic manufacturers, 15 for policy makers and environmental protection groups, 15 for plastic consumers and 12 for waste handlers and recyclers without replacement. This ensured that each respondent in all the categories had an equal chance of being picked and interviewed. The sample frame for scavengers was infinite and therefore a sample size of 20 was considered suffice by the researcher. This was a question of own judgment.

4.4 Methods of Data Collection

The researcher used both primary and secondary data collection methods in the survey. The specific data collection methods have been described below.

4.4.1 Primary Data Collection

Several primary data collection techniques were used in the survey and these are:

a) Key Informant Interviews

Interviews were carried out with representatives of the plastic chains who were considered knowledgeable in the subject under investigation. The key informants included, plastic manufacturers, policy makers, environmental protection agencies, consumers, Nairobi City Council, waste recyclers and handlers. The Kenya Association of Manufacturers was interviewed to get a comprehensive viewpoint on the plastic industry as some of their members are in the plastic business. The association has in recent times been in constant scrutiny by the media, particularly with regard to actions taken to address the problem of plastic waste. Hence, it was crucial to understand industry initiatives to alleviate the plastic waste management problem in Kenya.

The recycling sector in Kenya, particularly in regard to plastic waste is poorly developed. Interviews were therefore carried out with the few organizations in Nairobi involved in recycling plastic waste.

Local authorities are responsible for waste collection and disposal in urban areas in Kenya. Therefore, officials from the Nairobi City Council were interviewed so as to understand the issues relating to the management of plastic waste, and also the problems encountered in their proper collection and disposal. As the City Council is responsible for enforcing waste management policies in Nairobi, the initiatives taken by them to generate public awareness and in implementing the policies in the city were studied. Discussions were also held with the National Environment Management Authority (NEMA) on the problems relating to the enforcement of the Environmental and Management Coordination Act (1999). As part of the case study, the role of the retailers and consumers were also considered and representatives of these groups were interviewed.

Interviews with the Ministry of Trade and Industry and Ministry of Environment and Natural Resources respectively were also carried out to clarify the issues relating to enforcing the policies, and also to understand the priorities of the Government relating to plastic waste management in Kenya.

b) Surveys

Throughout the study, the researcher employed the use of both structured and unstructured questionnaires, which were administered to the respondents. A total of 82 questionnaires were issued. A set of questionnaires was developed for the policy makers and environmental protection agencies with 15 questionnaires being administered to the same, 25 questionnaires for plastic manufacturers, 15 for plastic consumers and 12 for the waste recyclers and handlers. Additional 20 questionnaires were used in the interviews with the scavengers (chokoras). These were later analyzed to come up with this final report.

c) Participant observation

The researcher visited several chain stores that use plastic papers as packaging materials, manufacturers of plastics, refuse handling agencies and the Dandora dumpsite where he participated in the activities as he made his observations that sharpened his insights on the subject matter. This proved useful, as he was able to get first hand information from his observations as the people handled the plastics.

d) Case Studies and In-depth Interviews

In order to get deeper insights on the plastic menace, it became necessary that the researcher spend more time with some respondents for in-depth interviews as well as case narrations. This brought about clearly the respondents personal experiences with plastics.

e) Photography

This was not used as a technique per se but was used to capture some of the activities and site that were either of interest or had been adversely affected by plastic disposal. However, for confidentiality and ethical considerations, manufacturers and chain stores could not allow photographs of their stores to be taken.

4.4.2 Secondary Data collection

Several literatures were reviewed which included journals publications, magazines, relevant books and electronic sources. These enabled the researcher to identify the existing gaps in the field of study and to develop the literature review.

4.5 Data Analysis

Since this study was an evaluative study most of the data collected was qualitative. However the use of questionnaires gave rise to some quantitative data upon their analysis. These have been analyzed and expressed as percentages and converted into pie charts and tables.

The researcher used both data and methodological triangulation in data analysis to avoid biases. The collected data was cleaned/edited for inconsistencies. For instance the Nairobi City Council appeared in both policy makers and refuse handlers categories. It was determined that since the levels of decision making and involvement in plastic waste management for the interviewed staff were different they should be treated independently/ differently hence city council appearing twice did not mean an inconsistency but a difference in role enactment and thus no effect on overall findings. The resultant responses in the questionnaires were analyzed, tabulated and expressed as a percentage of the entire population. The researcher used both general-purpose computer packages and specialized packages to develop various aspects of the responses that were given such as pie charts and tables. These have been presented as the final findings of the study below.

CHAPTER FIVE

5.0 DATA ANALYSIS AND FINDINGS

5.1 Sources of plastic bags and plastic bottles in Nairobi:

a) Plastic Manufacturers

Most of the plastic bags and plastic bottles are generated from the plastic manufacturing industries dealing with plastic products. *(Table 1 gives a profile of some of the plastic industries in Nairobi).* There are more than 150 plastic industries and the sector is growing at a rapid rate. Over 60% of these industries are located in Nairobi. Some of the new plastic industries are less than a year old while others are new branches of major plastic industries. A total of 15 industries in Nairobi area dealing with plastic in particular plastic bags and plastic bottles were visited during the study.

Many industries opt for plastic to make packaging equipment than other raw materials. High demand for plastic and the low cost of manufacturing were the main reasons given for opting to deal in plastics, with all manufacturers admitting that the high demand made them invest more in plastic.

93% of the industries visited produce between 5-500 tonnes of plastic per month while the 7% make between 501 tonnes to over 1000 tonnes per month. Over 80% of these manufacturers sell their products to packaging industries. 53% of the plastic is sold to supermarkets and other retailers, while 47% goes to other consumers. When asked about the options to plastic, 40% of the respondents in the industry chose investing in biodegradable options. 13% opted for glass while 6% opted for wood and paper as the alternatives to plastic.

All plastic manufacturers interviewed agreed that the plastic industry had grown rapidly in the past decade. 60% of the respondents felt that high demand for plastic bags was responsible for this growth. 27% felt affordability of the plastic bags and plastic bottles

was responsible for the growth while 13% saw convenience in the use of plastic as a major cause of the growth.

All manufacturers admitted they generate plastic waste from their factories. 73% generate between 1-20% as waste while 27% generate between 21-40% plastic waste from their factories. All the factories had a waste management plan exploring various options including recycling (66%) and selling 60%.

b) Recyclers

Recyclers also account for a good amount of plastic bags and plastic bottles in Nairobi. They get the waste from informal waste collectors and recycle it. Once recycled, they make plastic bags and plastic bottles which are sold to the packaging industries and other consumers. This finally disposes the waste back to the environment.

An estimated 2500 people make a living from scavenging at the Dandora dumpsite. Companies such as Kenpoly and Premium Drums buy waste plastic; Central Glass industries buys glass bottles and Kamongo waste paper employs scavenger to collect waste papers and food waste such as fish bones that are used to make fertilizers and animal feed.

c) Consumers

An interview with some consumers in Nairobi indicated that they use plastic bags and plastic paper wrappings. The reasons cited for the use of plastic bags and plastic paper wrapping are lower weight, use of less space, which reduces packaging, warehousing, and shipping costs. The disposal habits of the consumer's leads the plastic bags and plastic bottles to the roads and their light weight makes them spread all over.

d) Supermarkets

Supermarkets are a major supplier of plastic bags to the public, who later dispose it off to the environment making it a problem. A leading chain of supermarkets in Nairobi was

interviewed and they estimated that they release approximately 8 million plastic bags per month to the public.

e) Itinerant Waste Buyers

This category of waste buyers often buys waste collected by street boys (chokorahs) and in-turn sell it to recyclers. The problem is the economics involved in running the business. The cost is per weight collected. It is possible to benefit from plastic bottles but for plastic bags it is disappointing. Most people as a result do not collect the plastic bags. Instead they combine it with other types of plastic. The probability of rejection of plastic bags collected by wholesalers is more than their acceptance. This discourages most street boys from collecting plastic bags.

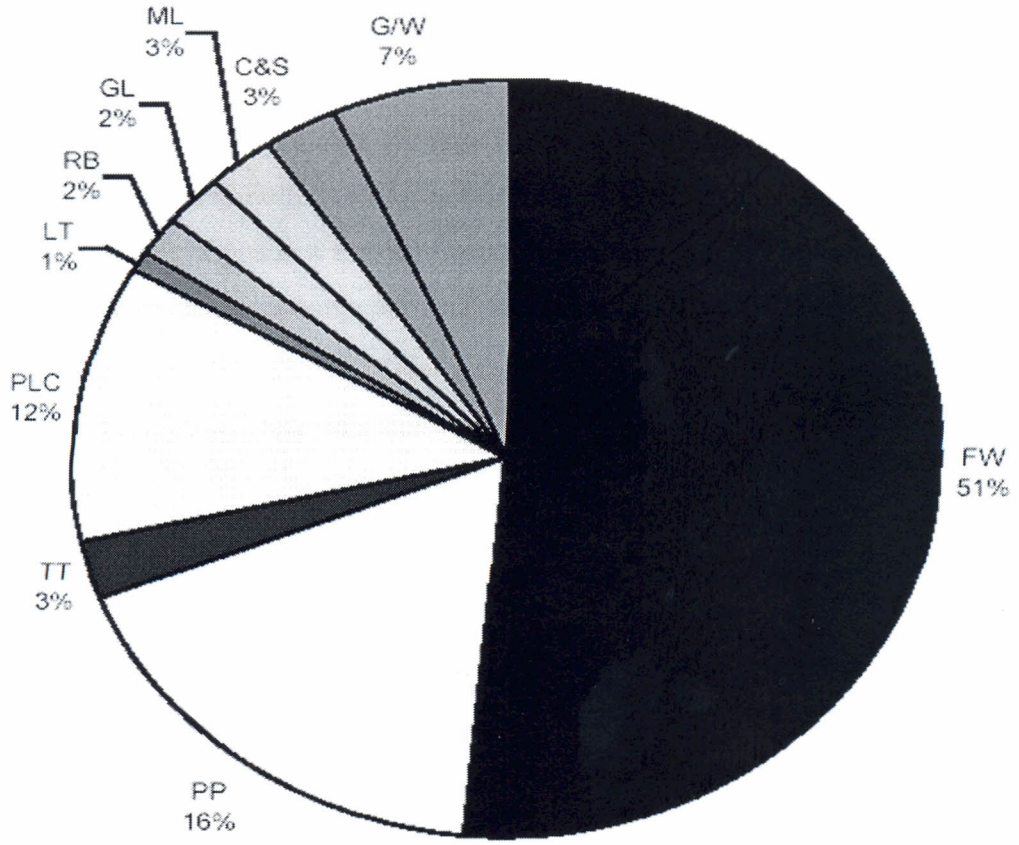
f) Importation of plastic bags and plastic bottles

More plastic, in particular plastic bottles and plastic bags are imported into the country either directly or indirectly when they are used to package commodities coming to the country from outside.

5.2 Solid Waste Generation compositions

From the study, the amounts of solid waste generated both at household and industrial level were ranked to determine priority waste and to give an understanding of the composition of wastes and how the separation of waste at source would be conducted. Of the wastes generated, food waste constituted 51.5%, waste paper (recyclable) 16%, plastic wastes 12%, textile waste 3%, leather wastes 1%, metals 3%, glass 2%, grass/wood 7%, ceramic and soils 3% and rubber waste was at 2%. This has been presented in the pie chart below.

Figure 4: Percentage of Plastic Waste and other Solid Wastes generated in Nairobi



Key

(FW) - Food Waste: 51.5%

(TT) - Textiles: 2.7%

(LT) – Leather: 0.9%

(GL) - Glass (containers and others: 2.3%

(ML) - Metal (containers and others): 2.6%

(C&S)- Ceramic and Soil: 2.7%

(G/W)- Grass/Wood: 6.7%

(PP) - Paper (Recyclable and Other: 15. 7%

(PLC) - Plastic (container and others):11.8%

(RB) – Rubber: 1.5%

Source: ITDG, 2004

5.3 Plastic waste collection and disposal

Waste is the responsibility of the local authorities in Kenya, but since the non-biodegradable garbage presents a value for the poor who eke out a living from the waste, it is often taken care of by the informal sector. The biodegradable waste along with the uncollected non-biodegradable garbage is taken care of by the local authority. The level of service for waste collection is, however, very poor. The failure to provide adequate collection services poses a serious threat in Kenya. Yet, it should be noted that limited finances and ever increasing demand on urban services handicap local authorities in Kenya.

Open dumping is the most commonly accepted way of disposing waste in Kenya. Waste is collected and transported to the dumping site e.g. Dandora in Nairobi. Dumping is also carried out illegally on private plots located in the city.

5.4 Environmental impacts of plastic bags and plastic bottles

All the respondents admitted that they received complaints regarding plastic bags and plastic bottles. The nature of the complaints comprised of blocked drainage systems, littering, livestock deaths, air pollution due to burning of plastics and pollution by tourists in recreation areas.

The two commodity plastics, extensively used in packaging have significantly contributed to the litter problem in the country. The problem with both these products is that there is a limited incentive for the waste pickers to collect them.

Plastic bottles have become an ideal food packaging material. Its low weight helps to reduce transportation costs and its convenience has led to higher consumer acceptance as compared to other packaging materials. With the rising use of plastic packaging in a variety of applications like edible oil, soft drinks, mineral water etc, there is a need to manage the large amount of plastic waste that is being generated.

For most Kenyan citizens the environmental problems of plastics have focused on the visible non-biodegradable plastic bags. Some of the main issues that have been associated with plastic bags in this respect are as follows:

Choked soil

Plastic bags are non-biodegradable, which means that they do not dissolve or disintegrate into the soil. Besides, they are non-porous, and do not allow the free flow of water and air, thereby choking plants.

Blocked drainage systems

Blocked drainage systems are a serious hazard caused by the plastic bags. Since plastic bags are light, and in cities like Nairobi, where rains are sometimes heavy, plastic bags end up blocking drainage systems, thereby causing water logging and inconvenience to the citizens.

Animal deaths

Whenever cows graze close to the dumping sites in Kenya, they ingest the plastics along with organic waste in it. Plastic bags kill animals by obstructing their intestines.

Food hazard

In addition to contributing to litter, plastic bags pose a major health hazard. The main hazards are associated with the chemicals used to colour plastic bags. Small amounts of lead are added during the manufacture, and these could permeate into food products stored in the bags.

5.5 Policies relating to Plastic Waste Management in Kenya

Responsibility to protect the environment and enforcement of the existing regulation lies with the Ministry of Environment and Natural Resources in Kenya. The study established that there are no comprehensive regulations in terms of policy and legislation touching on

waste management in Kenya. Except for statutes in various Acts, there is no specific policy for solid waste management in Kenya. These include but not limited to the following: Food Drugs and Chemical Act Cap 254, The Penal Code Cap 63, Public Health Act Cap 242 and Local Government Act Cap 265.

These statutes give a general provision on the various aspects that need to be preserved. For instance, Food Drugs and Chemical Act Cap 254, part II-the general provisions provides for disposal of chemical substances in prohibited manner and gives the provision for legal proceedings. Section 24 of the act states; Any person who uses or disposes any chemical substance in a manner likely to cause contamination of food or water for human consumption or in a manner liable to be injurious or dangerous to the health of any person shall be guilty of an offence.

The Penal Code Cap 63 stipulates the various categories of offences. For instance, under chapter XVII – Nuisance and offences against health and convenience, *Section 191-Fouling of water,* states; Any person who voluntarily corrupts or fouls the water of any public spring or reservoir, so as to render it less fit for purposes for which it is ordinarily used is guilty of misdemeanour. *Section 192-Fouling of air* also states that any person who voluntarily vitiates the atmosphere in any place so as to make it noxious to the health of the person in the dwelling is guilty of misdemeanour. Chapter XX- Duties relating to preservation of life and Health, *Section 219- Duty of a person in charge of a dangerous thing*, of the same imposes a strict liability to persons and states; It is the duty of any person who has in his charge or control, anything, whether living or inanimate, or whether moving or stationary of such a nature, in the absence of care or precaution in its use or management the life, safety or health of any person may be endangered, to use reasonable care and take reasonable precaution to avoid such danger; and he shall be deemed to have caused any consequences which adversely affect the quality of life or health of any person by reason of omission to perform that duty.

Public Health Act Cap 242 is the overriding legal authority regarding the local bylaws related to any matters that may be construed as affecting the health of the public. The Act

does not in itself define standards of design and construction, but it requests and can require local authorities (Municipal Councils, Urban and Area Councils) to make by-laws to define those requirements. (Section 126A). Within the Public Health Act, the sections on housing and prevention of mosquitoes are directly pertinent.

On sanitation the Act borrows from the common law doctrine of nuisance which makes it an offence for any landowner or occupier to allow nuisance or any other condition liable to be injurious or dangerous to health to prevail on his land. A medical health officer, once satisfied of the danger, may issue an order requiring the owner or occupier of the land to remove the nuisance.

In addition, the Minister on the advice of the Central Board of Health may make rules and confer powers and impose duties for the carrying out of environmental health matters. Such matters may include inspection of building for their sanitary condition, construction standards and ventilation for buildings, drainage of land, keeping of animals etc. Fighting malaria is also a critical environmental task dealt under the Act. Part XII makes it an offence to leave on one's land or premises, any collection of water, sewage, rubbish, well, pool, gutter, channel cesspit, latrine, urinal or dung pit where mosquitoes may breed. Such a situation constitutes a nuisance. Any person who fails to clear such a nuisance is guilty of an offence under the Act.

Environmental health requirements are also provided for under the general powers and duties of the local authorities in the Local Government Act (Cap 265). Municipal Councils are required to provide and maintain sanitary services, sewage and drainage facilities, take measures for the control, destruction of rats, vermin, insects and pests, control or prohibit industries, factories and businesses which emit smoke, fumes, chemicals, gases, dust, smell, noise vibrations, discomfort or annoyance to the neighborhood, and to prohibit or control work or trade of disinfection or fumigation by cyanide or other means.

However, since the development of the Environmental Management and Coordination Act (EMCA) in 1999, there have been efforts aimed at managing plastic waste in the country. One such effort was the gazettement and application of waste thickness standard in October 2003 and the development of a ten-point action plan to manage plastic waste in Kenya. This includes plastic bags and plastic bottles. The Act has several provisions on various environmental quality standards relating to waste classification and disposal methods (sec 86) licensing (sec 89, 91, 92) and penalties for non-compliance. (Kariuki 2004)

NEMA has developed draft standards, regulations and guidelines and standards to implement EMCA 1999. However still, lacking conspicuously is specific provisions on plastic waste management. The process started in 2003, launched six taskforces on water quality; Land use, Chemical and pesticides, Biological resources and genetic resources, Waste management and economic instruments. So far the drafts have been presented to the Standards Enforcement and Review Committee (SERC). On solid waste management, the focus is on radioactive wastes, industrial waste, municipal waste, bio-medical waste and agricultural waste pest control products.

Policy on waste management in Kenya is general with little or no specific emphasis on plastic, in particular polythene waste management. The Kenya Bureau of Standards (KBS) has several standards on plastic waste management in Kenya. The relevant KBS touching on plastic waste management includes:

Plastic thickness standard: KS 1794.

Standards on plastic waste thickness gazetted in October 2004 and applied.

Waste standards: KS 1494: 2001

The Code of practice for storage and on-site treatment of solid waste from buildings: It gives recommendable methods of storage and on-site treatment of solid waste from residential and commercial buildings and hospitals with the exception of medical waste and it lays down recommended practices of collection and good hygiene

Lack of policy on plastic waste management in the country was attributed to a number of factors:

- Bureaucracy involved in developing, gazetting and applying a policy was a constraint to development of new policies to deal with plastic especially plastic bags and plastic bottles.
- Lack of alternative for the increasing population which depends on plastic for almost all their packaging needs was seen as another constraint to making a decision to be put in the form of policy.

The other major reason was that concerns on plastic especially plastic bags and plastic bottles as a problem had only increased recently and action was underway.

5.6 Compliance to policies

The study revealed that there was a general consensus that policies on plastic waste management were non-existent. Even the few policies that existed were lax, poorly complied with, applied discriminately hence poorly enforced. 50% of the policy makers felt that the industry and the consumers only partially comply with the policies in place, 34% felt that there was non-compliance coupled with poor enforcement while 16% were not sure of the status of compliance to policies.

General opinion of the manufacturers on design of the policies was that the existing policies were poorly designed with improper implementation and enforcement mechanism. Lack of monitoring and evaluation for compliance was cited as a major impediment. According to the industries, 46% partially comply, 22 % fully comply, 18%

do not comply totally while 14% were unsure of the rating of their compliance with the policy.

5.7 Strengths and weaknesses of existing policies

Several parameters were used to evaluate the strengths and weaknesses of the existing policies. These included, ease of implementation, effectiveness of the policies, their adequacies and ease of enforcement of the policies. The responses have been tabulated below.

Table 1: details of the strengths and weaknesses of existing policies based on responses from the study

Parameter	Policy		Industry	
	Yes	No	Yes	No
Ease of implement	33%	67%	40%	60%
Effectiveness	35%	65%	50%	50%
Adequacy	40%	60%	49%	51%
Ease of enforcement	20%	80%	29%	71%
Monitoring and evaluation	30%	70%	27%	73%

Source: Researcher 2005

From the above data it was evident that implementation, effectiveness, adequacy ease of enforcement and monitoring and evaluation of the existing policies was wanting.

CHAPTER SIX

6.0 DISCUSSION

6.1 Analysis of the existing policies

The analysis revealed that there are no specific policies that exist for addressing issues related to plastic waste in Kenya. As a result it has not been possible to address the issue of the littering of plastic bags and plastic bottles and as such there is no long-term solution to the problem. However, there are general waste management policies that were identified and analysed in the previous chapter.

Before the enactment of the Environmental Management and Coordination Act (1999), local authorities had monopoly control over sanitation and solid waste management services in Kenya, largely under the Local Government Act (CAP 265) and Public Health Act (CAP 242). The Local Government Act empowers local authorities to establish and maintain municipal solid waste management services while the Public Health Act requires them to provide the services. The Acts, however, neither set standards for the service nor require waste reduction or recycling. In addition, the Acts do not classify waste into municipal, industrial and hazardous types or allocate responsibility over each type.

During the study, it became evident that waste management policies in Kenya have for a long time been unclear. This has been more so because of lack of clear guidelines on what constitutes waste and methodologies of collection, treatment and disposal of wastes. In the past, the Public Health Act and the Local Authorities by-laws have been used for addressing solid waste issues. The Public Health Act places a duty on all local authorities to provide solid waste management services. The Local Government Act gives power to local authorities to establish and maintain solid waste management services. The local authorities such as the Nairobi City Council (NCC) have enacted several by-laws through which they attempt to regulate the solid waste management activities.

Generally the Acts are deficient in setting standards and conditions covering the key aspects of solid waste management particularly operational aspects. The Acts do not

define standards for collecting, treating and transporting solid wastes or for the proper management of landfills and they do not refer to waste reduction or recycling. Enforcement mechanism and penalties are contained in the existing by-laws. However, enforcement seems to be weak since the by-laws fail to define the standards of waste, penalties are low and do not deter violators.

The only comprehensive legal and institutional framework for the management of the environment in Kenya is the Environmental Management and Coordination Act (EMCA) of 1999. The legislation was formulated to help in managing the environment including addressing associated issues such as waste management. The Act states "no person shall discharge or dispose of any wastes, whether generated within or outside Kenya, in such a manner as to cause pollution to the environment or ill health to any person". However, detailed analysis of the Act has revealed that it has not been effective in dealing with the issues of plastic waste and its associated problems. The Act does not specifically address the issue related to plastic waste management. So the failure to incorporate a long-term solution to address the problem of plastic waste has been the key limitation of existing policies.

The problems related to plastic bags and bottles have predominantly arisen due to indiscriminate use and disposal, and the lack of an efficient waste management system. The Act fails to address this indiscriminate use by creating suitable disincentive towards use of plastic bags and bottles. Further, the Act fails to make provisions for improving the existing waste management system in Kenya.

Even though EMCA provides for the use of economic instruments in environmental management, however, the National Environment Management Authority (NEMA) has yet to develop operational guidelines for that purpose.

6.2 Strengths and weaknesses of existing policies

A comparative analysis of the waste management policies in developed and developing world shows a greater dichotomy in formulation, implementation and enforcement. While increasing environmental awareness and the realization that a better protected environment is essential if higher living standards are to be maintained have resulted in the establishment of stringent environmental laws, especially in the developed countries, developing countries are still grappling with lots of environmental problems. These laws are generally aimed at the prevention of uncontrolled and careless disposal of waste material. Unfortunately, in the developing countries like Kenya, lack of awareness, technical capability and financial constraints have made the countries unable to act and as a result indiscriminate dumping of waste is still prevalent.

Inadequacy and poor enforcement of policies were the key weaknesses of the policies relating to waste management in the country. The difficulties in implementing the existing policies were mainly attributed to lack of awareness and limited capacity in terms of equipment and funding to manage the waste as the main factors. Other factors were poor enforcement and corruption.

The major challenges facing plastic waste management in Kenya was considered to be poor enforcement of existing policies. Other challenges included, poor performance by local authorities, lack of awareness, lack of policies to address specifically plastic waste management and the nature of plastic waste

There was conflicting information from the policy makers on the duration the policies have been in place. Some of them said the policy had been in place for 1-5 years while others said the policy had been in place for over 20 years.

6.3 Evaluation of the implementation and effectiveness of existing policies

The implementation and the effectiveness of the policies was a major highlight of the study with consensus that it was poorly designed. Several policy makers said the existing

policies and legislation was not evaluated to ascertain their effectiveness. The rest said policy was evaluated with audits and reports as the main tools. In addition NEMA gives a requirement that before a major development is put in place it has to undergo an Environmental Impact Assessment (EIA). The environmental audits are conducted annually and the audit reports submitted at the end of every year. 80 % of the industries said they get evaluated while 20% did not. Evaluation according to the industries was through audits (80%), report submission (73%), and it was done on an annual basis. On the basis of these facts, it is clear that the monitoring and evaluation process of the existing policies in Kenya has been poor.

6.4 Awareness

The study revealed awareness gaps both for the consumers and the manufacturers of plastics. This calls for serious awareness campaigns on the impacts and threats that the plastics pose to the environment as well as policy issues on waste management. The EMCA for instance gives all citizens a *locus standi* for a clean environment but the people are not aware of these entitlements.

6.5 Communication of the policies

It is not enough to formulate just policies but their communication to the users of such policies to raise awareness on their existence, implementation and enforcement is equally integral.

The main criteria for communicating policies to the target groups were considered to be the print media with 50% of the respondents sharing the view. Others included lead agencies and electronic media. The most effective way of policy reaching the manufacturer was by making them purchase a policy document in the event of wanting to open a plastic industry. This way they are able to buy and read the regulations and it goes to all registered industries. Another way of communicating the policy was through the Kenya Association of Manufacturers where all registered members subscribe to one code of conduct comprising the policy requirement.

6.6 Improving the existing policies

Since certain policies already existed though with the strictest term not on plastics, respondents were consulted on what could be done to improve the policies. The manufacturers interviewed thought there was a need to develop new policies that could specifically address the issues related to plastic waste. A few of the manufacturers called for effective enforcement of the already existing ones and for revision of the existing policies.

However, in order to effectively address the issues of plastic waste management, all manufacturers chose formulation of efficient policies as the key strategy and ensure proper enforcement of these policies. The use of economic instruments including incentives to recyclers and plastic manufacturers was considered as the key to success in managing plastic waste.

To succeed in the business of recycling, manufacturers felt that one main action was to educate on the economic potential of recycling. Raising awareness on conservation and to instill sustainable practices to the consumers was also key.

6.7 Initiative to address the issue of plastic waste in Nairobi

NEMA has in the past brought a wide range of stakeholders together in the form of a consultative stakeholder committee on plastic waste management. The stakeholders include NEMA itself, the Kenya Association of Manufacturers (KAM), KAM's plastics sector group, the Ministry of Environment and Natural Resources, the Ministry of Local Government, the Ministry of Trade and Industry, the Kenya Industrial Research and Development Institute (KIRDI), plastics retailers, and plastics consumers.

The committee had, moreover, drawn up a road map for plastic management in the country (Table 2) with focus being on banning of plastics thinner than 30 microns,

encouragement of recycling, collection of plastics already in the environment, reduction of littering through legal instruments, development of disposal guidelines, and design of economic instruments to improve the management of plastics. Viewed from this roadmap, the policy package being designed can be seen as elaborating on and improving the activities agreed upon, and fast tracking of the economic instruments activity.

Table 2: Stakeholder negotiated road map for plastics management

Activity	Target	*Implementation date*
Ban very thin or flimsy plastics through a standard on thickness (minimum of 30 microns)	Complete and immediate phase out; complete enforcement within a year	*By July 2005. Kenya Bureau of Standards to publish the standard by end of 2004*
Encourage recycling of plastics through incentives such as differential power tariffs and investment tax allowances (140%) for recycling machinery	Plastic manufacturers to recycle 15% of their output; Local authorities and outlets to recover 75% of plastics used	*By 2006; incentives to be included in the 2005 Finance Bill*
Collection of plastics already in the environment	No plastic wastes in the country's major cities	*By July 2005*
Put in place legal measures on littering	Each city and municipal council to have by-laws on plastics	*By July 2005*
Development of better plastic disposal methods	Develop plastic disposal guidelines	*By July 2005*
Study the possibility of introducing appropriate economic instruments	Politically, socially and economically acceptable instruments	*By 2006*

Source: NEMA (2001)

Currently, a committee to oversee implementation of the road map is already in place and a Kenyan Standard (KS-1794) for polythene bags has been approved. The committee has set up a contributory fund to raise resources for awareness creation and public campaigns against littering and improper disposal of plastics. It recognizes the value of establishing linkages with best practice global efforts towards effective and efficient management of plastics.

6.7.1 Pilot project on sustainable management of plastic waste in Nairobi

In June 2005, the United Nations Environment Programme (UNEP) in collaboration with the National Environment Management Authority (NEMA), the Kenya Association of Manufacturers (KAM), the Kenya National Cleaner Production Centre (KNCPC) and other stakeholders initiated a pilot project on the sustainable management of plastic waste in Nairobi. The project aims at developing and promoting a comprehensive plastic waste management programme that would facilitate the actions that need to be taken by the government, industries, distributors, retailers and consumers in managing plastic. This effort builds upon the experience of the implementation of the 10 point action plan that has been developed and implemented by NEMA and KAM.

The project attaches particular emphasis to the promotion of economic, social and environmental benefits through components that promote reduction, reuse and recycling of plastic products. In addition to the overall environmental benefits through the reduction and recycling of plastic waste, the implementation of this project is contributing to creation of jobs to unemployed youth and women groups who are being supported by a co-operative society that has been formed in furtherance of this project. The experience to be gained from the implementation of this pilot project is also expected to provide useful lessons that could be replicated in other African countries.

CHAPTER SEVEN

7.0 SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

7.1 Summary of Findings

The analysis revealed that there are no specific policies that exist for addressing issues related to plastic waste in Kenya. As a result it has not been possible to address the issue of the littering of plastic bags and plastic bottles and as such there is no long-term solution to the problem. Other major findings included:

- Generally, waste management policies in Kenya have for a long time been unclear;
- The problems related to plastic bags and bottles have predominantly arisen due to indiscriminate use and disposal, and the lack of an efficient waste management system;
- Inadequacy and poor enforcement were the key weaknesses of the existing policies relating to waste management in the country;
- Lack of awareness both for the consumers and the manufacturers of plastics was also a key finding of the study.

7.2 Conclusions

The waste management process in Kenya needs complete reorganization, with a clear definition of roles and responsibilities among the various stakeholders. Looking into the underlying causes of littering, the end of life management of the products in question contributes to the problem. It is also undeniable that the gradual changes in lifestyle, littering habits of citizens, and lack of an efficient waste management system contribute to the widespread problem. So, policies aiming to address littering should not only focus on preventing waste generation, and reducing the throughput of the products, but also consider re-organizing the waste management system to keep pace with the changing consumption patterns of society.

It has been realized that waste management is not the sole responsibility of the municipal authorities; instead, it needs the involvement of all the stakeholders. This is crucial for improving the existing system.

Plastic waste is a pressing issue in the country today. A large number of Kenyans have turned away from traditional modes of consumption, and are moving towards more wasteful patterns of resource use. The increasing purchasing power and consumerism of the burgeoning Kenyan middle class is moving Kenya into the vicious use-and-discard cycle. Given this scenario, it is crucial for Kenya to check the use of plastic in the country. Therefore there is an urgent need to identify policy options that can help in establishing an efficient waste management process.

The analysis led to the conclusion that a package of policies rather than a single policy is required. However, finding solutions to these problems calls for an active involvement and the cooperation of all stakeholders.

7.3 Recommendations

Numerous instruments have been used around the world to manage the problem associated with plastic waste with various degrees of success. The instruments range from such command and control tools like outright bans, to voluntary schemes such as codes of practice and promotion of alternatives. The economic instruments used include taxes or levies.

7.3.1 Environmental Tax on Plastics

As the experience of the countries, albeit mainly developed, that have implemented a kind of levy or tax on plastic bags has shown, such an instrument reduces the consumption and therefore production of plastic bags considerably. It is on this basis that the introduction of a levy on plastic bags in Kenya is highly recommended.

A tax could be levied on the plastic industry as a means to generate revenue for waste management. The environmental tax could be intended to encourage the development of

new and alternative products, and also provide revenues for waste management. A tax could be levied on the plastic products, in this case on plastic bags and plastic bottles, as a means to internalize the external costs associated with the products. Further, the tax should also be able to discourage consumption, and trigger the consumers to make the right purchases. This would in turn reduce the amount of waste generated from plastic bags and bottles.

An environmental tax on plastic bags and bottles either targeted at producers or retailers can have the effect of suppressing consumer demand for plastic bags and bottles, and inducing consumers to use other alternatives. According to the Irish environmental tax on plastic bags, a levy of EUR 0.04 (IEP 0.03) on every bag was to be charged to suppliers. The study found that this would be less effective in suppressing demand, than forcing retailers to charge customers for using carrier bags, but would be simpler to administer and would be less of a burden on Ireland's many small food retailers (ENDS, 1999).

Despite the merits of an environmental tax, there are several problems affecting their effectiveness. In Italy an environmental tax of ITL 100 (USD 0.06) was only imposed on non- biodegradable plastic bags. Due to the unclear definition of biodegradability, there was an increase in the production of plastic bags declared as biodegradable. As a result, after the first year of introduction, a downward trend of 9% in consumption of plastic bags was observed but the consumption of plastic bags increased by 16% in the second year (Fung, 2000).

In the context of Kenya, an environmental tax will have the benefit of generating revenue, which could be utilized for improving the waste management practices, invested into upgrading the recycling sector, and development of biodegradable products. However, such an environmental tax is difficult considering the large number of retailing outlets of plastic bags. So a good enforcing capacity is crucial for implementing an environmental tax. Further, the tax rate has to be set at a level that affects consumption, and forces consumers to move towards other alternatives. If the demand for plastic bags

and bottles is highly elastic, and consumers can easily move towards the usage of substitutes then the tax may be effective.

In essence an environmental tax on plastic bags and bottles may be a good idea but requires a good regulatory capacity to enforce it. Careful design of the tax is required if it is aimed at minimizing consumption, and at the same time it should not be too high to create barriers, and encourage industry to adopt undesirable practices. Further cost effective substitutes need to be encouraged so as to dissuade the consumers from use of plastic bags and bottles. For acceptability and therefore effectiveness of the tax, the revenue collected should be earmarked for environmental protection projects.

7.3.2 Separation of Waste at Source

In studying the stakeholders involved, it was concluded that there are several interdependencies that characterize the plastic waste management system in Kenya. These links need to be strengthened and waste generating agents also need to participate actively in improving the existing waste management system. Separating waste at source is one option that can be effectively carried out by involving all stakeholders.

Separation of waste at the source by the households would help to reduce the burden of the waste pickers and the local authorities. The non-biodegradable waste has a value and would be taken care of by the informal sector and the organic waste that is fairly clean could be composted. This may prevent the households from disposing garbage in plastic bags that makes it unhygienic for the waste pickers to collect them. In order to implement the idea of source separation in practice, a primary requirement is awareness among the households. Awareness needs to be generated in a broad way to ensure that source separation is a success.

Decentralizing the waste management system

In terms of interventions for improving waste management in the country, three issues need to be addressed: First, plans for revamping the formal system should not ignore the social and economic dimensions of the informal sector in the waste management process

(Baud, Schenk, 1994). Second, it is necessary to bring a change in attitudes, which views waste management as a responsibility of the local authorities and treats waste picking as an illegal activity (Venkateswaran, 1994a and 1994b).

Therefore, it is worth considering the integration of the informal practices with the existing formal system and look into options of decentralizing waste management with the involvement of the waste pickers. The waste pickers must be seen as an industrial enterprise and schemes and opportunities to improve this sector are necessary for a clean environment. This can come about only with the integration and cooperation of the waste pickers, consumers and local authorities. Bringing together the three stakeholders and defining roles and responsibilities can fully help in decentralizing waste management.

7.3.3 Reorganization of the Recycling Sector

The market for recyclable materials is crucial for building a source separation programme, and one of the main concerns today is the quality of recycled products. The recycling industry has to be promoted as it presents a source of livelihood to hundreds of people in the country. However the current practices employed in the recycling sector make it highly unsustainable. Slight efforts by the government to encourage this sector can really help to improve the quality of recycled products in the country.

7.3.4 Extended Producer Responsibility (EPR)

Extended Producer Responsibility is an emerging principle focusing more on products rather than production facilities. In a broader sense extended producer responsibility is a strategy that aims to achieve a decreased total environmental impact from the entire life cycle of the product (Lindhqvist, 2000). This aim could be achieved by making the producers bear a degree of responsibility for the environmental impacts of their products throughout the products life cycles, including upstream impacts arising from the choice of materials, from the manufacturing process and downstream impacts from the use and disposal of the products (Davis, 1997).

One of the regulatory instruments that embody extended producer responsibility includes mandatory take-back where a producer takes back a product at the end of its useful life either directly, or through a third party.

Deposit refund system

A Deposit Refund System (DRS) imposes an upfront charge, the deposit, so as to encourage efficient resource use, prevent littering and save disposal costs. It guarantees a return of that charge, the refund upon assurance that the activity has been undertaken. The purpose of DRS is to induce buyers of the products in the system to return the empty packaging for some kind of reprocessing, either reuse or recycling. A DRS directly affects reuse and recycling since it helps to make containers available for such action.

7.3.5 A ban on plastic paper bags less than 30 microns in thickness

The production and consumption of plastic bags of less than 30 microns should be banned to take care of the inadvertent littering. Thin bags tend to be easily dispersed by wind and water thereby clogging drains, chocking livestock and littering landscapes. As the experience of many countries has shown, a ban is the most effective way to deal with very thin plastics considering their high vulnerability to littering, single-use character, low price and poor recycling feasibility.

7.3.6 Consumer awareness and anti-littering campaigns

Active support should be extended to existing consumer awareness and anti-litter campaigns, which are mainly voluntary and few. In addition, coordinated anti-littering and consumer awareness campaigns should be developed in the country. While consumer awareness and anti-littering campaigns are often the interventions most favoured by the industry, it has the shortcomings that (i) a segment of the population will always continue to litter, and (ii) it cannot prevent inadvertent littering of plastic bags and bottles. Education is, nevertheless, an important support for other initiatives aimed at reducing plastic waste and its impact.

7.3.7 Promotion of voluntary schemes (A National Code of Practice for Retailers)

Codes of practice for plastic bags among retailers are common in many developed countries. Such codes commit retailers to, among other things:

- A specified reduction, of the number of plastic bags issued, within a specified period;
- An increase in the recycling rate of plastic bags within a specified period;
- Introduction of plastic bags made from recycled material;
- A specified period within which thin plastic bags made from non-recycled plastic can be phased out;
- Targeted reduction in plastic bag litter within a specified period;
- Availability in retail outlets of multiple use bags;
- Provision of convenient and accessible recycling stations to consumers
- Objective audit of code effectiveness;
- Targeted minimum participation in the code by the retailers within a specified period.

7.3.8 Support for the development of a managed disposal system

Even with a tax levied on plastic bags and an elaborate recycling system, some plastics will reach the disposal stage. In general, Kenya and particularly Nairobi has enormous disposal problems ranging from indiscriminate dumping, existence of only one open dumpsite which is actually full, distant location of the dumpsite along a road that has heavy traffic and without transfer facilities, location of the dumpsite in a densely populated residential area, lack of fencing, lack of basic landfill management operations like compaction and inaccessibility of the dumpsite due to gangs among others. Guidelines on the proper disposal of plastics therefore need to be urgently developed.

7.3.9 Areas for Future research

There is a need for further research with regard to plastic bags and bottles. Replacement of non-degradable plastics with degradable plastics, particularly for single-use disposables and packaging applications, is of major interest to decision-makers. Thus, in view of the limited research conducted, it would be worthwhile to carry out a detailed study on alternatives to non-degradable plastics that could be introduced in Kenya in the long-term.

ANNEXES

Annex 1: Profile of some of the plastic industries in Nairobi

Industry/ Company	Location	Products	Description
NAS Plastic	Enterprise road in Industrial area.	Manufactures plastics for the airline, drinks containers such as coke, polythene for packaging etc.	The recycle their plastic waste. Sells polythene to styroplast Industries Ltd. Produces 150 tones/month
Afro plastics	Baba Dogo area in Nairobi.	Plastic containers PET bottles	
Uni-plast	Baba Dogo, Nairobi	Plain and printed polythene.	Manufacture polythene products from virgin material. Does not recycle street waste. Recycles only factory waste.
General Plastics Ltd.	Enterprise road, Industrial Area, Nairobi.	Manufacture various types of containers from virgin materials.	Factory waste includes trimmings, used and worn out polythene. Granules are sold to water container manufacturers. Polythene packaging material for their small containers is supplied by premium drums.

In-plast	Lunga lunga road, Industrial area.	Recycles polythene street waste.	The only enterprise in NRB that recycles polythene street waste.
Styroplast Ltd	Enterprise road, Industrial area Nairobi.	Polythene carrier bags and sheeting materials from virgin material for both local and export.	
Packaging master Ltd.	Lunga lunga Road	Polythene carrier bags from virgin material.	Sell their factory waste to water container manufacturers. 50-100 tonnes /months
Packaging Industries Ltd.	Off Likoni Road, Industrial area.	Polythene carrier bags, and sheeting.	Has a recycling unit for factory waste. Over 900 tonnes/months Part of waste re-used and most is sold to container manufacturers. Initiated collection of carrier bags from Uchumi super markets in 2002.
Polythene Industries Ltd.	Mombasa Road	Polythene carrier bags and sheeting material for various sectors.	250 tonnes/ month. Sells the polythene to leading supermarkets including Uchumi and Nakumatt and other packaging industries. Does not recycle

Alankar Industries Limited	Ectoville Estate Road A, Industrial Area.	Plastic products including Polythene bags.	Over 200 tonnes per month, sell the polythene products to packaging industries.
King Plastic Industries Ltd	.Enterprise Road Industrial Area.	Polythene bags and sheeting	Recycles only factory waste.
Polyflex	Enterprise road, Industrial area.	Polythene and sheeting	Manufacture polythene and sell to packaging companies.
Hi-Plast Ltd	Off enterprise road, Hillocks estate.	Polythene and sheeting	Produces polythene and sell to packaging industries.
Safe Pak Ltd.	Mombasa road.	PET bottles, Sports Caps, PVC Sleeves Neck etc	Manufacture and sells the P.E.T bottles to packaging industries.
Tec Pack Industries Ltd	Road A, Off Enterprise road	Yoghurt Cups, Disposal Glasses	Recycles only factory waste.

Annex 2: Additional picture of plastic waste in Nairobi

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